# Newton’s Laws of Motion

Sir Isaac Newton lived during the 1600s. Like all scientists, he made observations about the world around him. Some of his observations were about motion. His observations have been supported by more data over time; and we now call these Newton’s Laws of Motion. His laws of motion explain rest, constant motion, accelerated motion, and describe how balanced and unbalanced forces act to cause these states of motion.

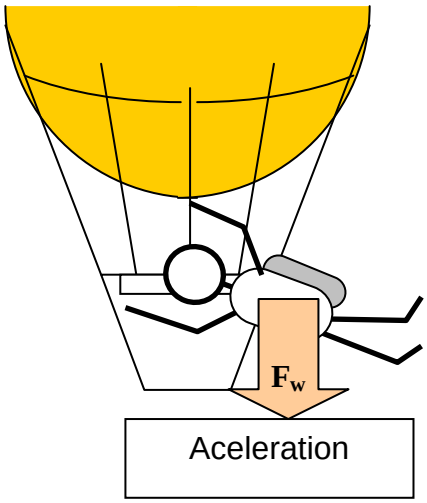
Review the three laws of motion:

***Newton's first law of motion*** says that an object will remain at rest or in uniform motion in a straight line unless acted on by an unbalanced force.

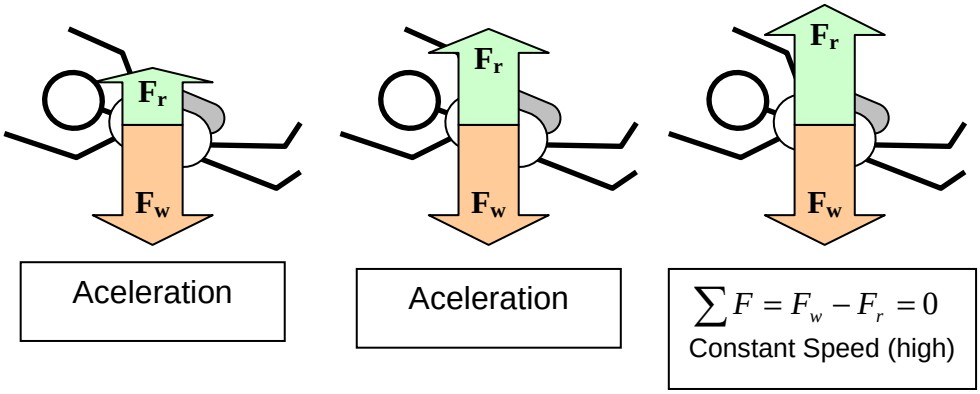
***Newton's second law of motion*** claims that a change in motion occurs only if a net force is exerted on an object.

***Newton's third law of motion*** states that for every action there is an equal and opposite reaction.

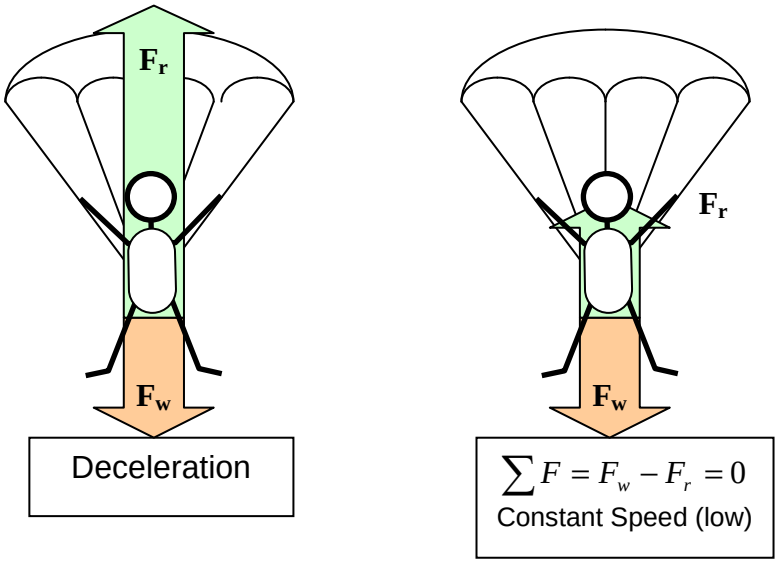
Consider a parachutist who jumps from a balloon. The initial vertical speed of the parachutist is zero. However he will immediately be acted upon by his weight acting vertically downwards and since the external resultant force is not zero he will accelerate downwards ***(second law)***.




As the parachutist’s speed increases so does the air resistance. This opposes the downwards force of his weight and means that he will not increase in speed indefinitely. Eventually the air resistance will increase until it equals his weight. At this point the resultant force on the parachutist will be zero and he will stop accelerating; instead he will continue to fall at a constant or terminal velocity ***(first law)***. For the human body this is about 45-55 m/s.




When the parachutist pulls the rip-cord and the parachute is opened the air resistance is suddenly increased such that it is greater than his weight. The resultant force is upwards meaning that the parachutist will start to decelerate ***(second law)***. This will continue with the air resistance reducing until the forces are again equal and the speed of fall is constant ***(second law)***. At this point the terminal velocity should be only a few m/s.




After landing, the parachutist stands on the floor, pulled down by the Earth with a force (weight). However, it does not move in that direction, because the floor stops it. Obviously, the floor is exerting on it an equal and opposite force (normal force) ***(third law)*.**